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Electrical Safety and the Qualified Person

BY DENNIS K. NEITZEL, CPE

The objective of OSHA and NFPA, as well as others, is to protect employees from electrical hazards. Potential hazards from electricity include electrical shock, arc-flash and arc-blast. This article will focus on an overview of the requirements for conducting an electrical hazards analysis, selecting personal protective equipment, and providing the required training and procedures to help protect employees.

Electrical Hazards Analysis

The results of an electrical hazards analysis constitutes one of the most important factors in the selection of personal protective equipment, developing a training program for qualified persons, and developing an effective electrical safety program.

OSHA 1910.132(d) requires the employer to perform a hazard assessment of the workplace to determine if personal protective equipment is necessary. NFPA 70E-2004 paragraph (B)(1) further defines what is required by requiring a Shock Hazard Analysis and a Flash Hazard Analysis for equipment operating at 50 volts or more. The shock hazard analysis is used to

determine the voltage exposure, shock protection boundary, and the required PPE necessary to protect employees and minimize the possibility of electrical shock. The flash hazard analysis is also used to help protect employees by establishing the flash protection boundary and required PPE to protect employees.

The electrical hazards analysis also identifies the requirements for an Energized Electrical Work Permit. Where employees are exposed to energized conductors and circuit parts operating at 50 volts or more, which have not been placed in an electrically safe work condition, the hazards must be identified on the work permit along with the required PPE and work procedures. The Energized Electrical Work Permit must be written, signed and authorized by management, and it must be used in order to protect employees who are or may be exposed to any electrical hazards. Essentially the hazard

analysis helps to ensure that the training and PPE selected is appropriate for the hazards present in the workplace.

Personal Protective Equipment

Again referring to OSHA 1910.132, Subpart I, Personal Protective Equipment, paragraph (d) requires employers to perform a hazard assessment of the workplace to determine if personal protective equipment is necessary. The hazard assessment is an important part of the process to help ensure that the PPE selected is appropriate for the hazards that are present in the workplace. Paragraph (d)(2) requires employers to certify that they performed a hazard assessment. The signed certification must include the date of the hazard assessment and the identification of the workplace evaluated (area or location). OSHA compliance officers may require employers to disclose the certification records during an Agency inspection.

Training is also a requirement as stated in OSHA 1910.132(f)(1): The employer shall provide training to each employee who is required by this section to use PPE. Each such employee shall be trained to know at least the following:

- When PPE is necessary;
- What PPE is necessary;
- How to properly don, doff, adjust, and wear PPE;
- The limitations of the PPE; and,
- The proper care, maintenance, useful life and disposal of the PPE.

Paragraph (f)(2) goes on to state that; Each affected employee shall demonstrate an understanding of the training specified in paragraph (f)(1) of this section, and the ability to use PPE properly, before being allowed to perform work requiring the use of PPE. Paragraph (f)(3) further states that;



When the employer has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by paragraph (f)(2) of this section, the employer shall retrain each such employee. Circumstances where retraining is required include, but are not limited to, situations where:

- *Changes in the workplace render previous training obsolete; or*
- *Changes in the types of PPE to be used render previous training obsolete; or*
- *Inadequacies in an affected employee's knowledge or use of assigned PPE indicate that the employee has not retained the requisite understanding or skill.*

Paragraph (f)(4) of 1910.132 states: The employer shall verify that each affected employee has received and understood the required training through a written certification that contains the name of each employee trained, the date(s) of training, and that identifies the subject of the certification.

NFPA 70E-2004, paragraph 130.3(B) addresses the requirements for protective clothing and personal protective equipment for application with a flash hazard analysis. When work is to be performed within the Flash Protection Boundary, the flash hazard analysis must be used to determine the incident energy levels that the employee will be exposed to. The incident energy value is then used to select the proper flame-resistant personal protective equipment to be used by the employee for the specific task to be performed.

Other personal protective equipment, that is often overlooked, is the requirement to use insulated hand tools. OSHA 1910.335(a)(2) requires that: **When working near exposed energized conductors or circuit parts, each employee shall use insulated tools or handling equipment if the tools or handling equipment might make contact with such conductors or parts.**

A common misconception is that when using insulated tools, rubber-insulating gloves are not needed. This is a false concept. The primary purpose of rubber gloves is shock protection and the primary purpose of insulated tools is to prevent an electrical arc-flash. They must be used together in order to help avoid the electrical hazards.

A good summary statement comes

Table S-4: Typical Occupational Categories of Employees Facing A Higher Than Normal Risk of Electrical Accident

Occupation	
Blue collar supervisors ⁽¹⁾	Material handling equipment operators ⁽¹⁾
Electrical and electronic engineers ⁽¹⁾	Mechanics and repairers ⁽¹⁾
Electrical and electronic equipment assemblers ⁽¹⁾	Painters ⁽¹⁾
Electrical and electronic technicians ⁽¹⁾	Riggers and roustabouts ⁽¹⁾
Electricians	Stationary engineers ⁽¹⁾
Industrial machine operators ⁽¹⁾	Welders

Footnote⁽¹⁾ Workers in these groups do not need to be trained if their work or the work of those they supervise does not bring them or the employees they supervise close enough to exposed parts of electric circuits operating at 50 volts or more to ground for a hazard to exist.

from OSHA 1910.335(a)(2)(ii) which states: Protective shields, protective barriers, or insulating materials shall be used to protect each employee from shock, burns, or other electrically related injuries while that employee is working near exposed energized parts which might be accidentally contacted or where dangerous electric heating or arcing might occur. When normally enclosed live parts are exposed for maintenance or repair, they shall be guarded to protect unqualified persons from contact with the live parts.

Training Requirements

One of the most important aspects of electrical safety is to ensure that all employees who are or may be exposed to energized electrical conductors or circuit parts are properly trained and qualified. The first thing that must be discussed is how to identify who a qualified person is. This has always been a point of debate throughout industry, but is clearly defined by the National Electrical Code (NEC), NFPA 70E, and OSHA. The NEC defines a qualified person as; One who has skills and knowledge related to the construction and operation of the electrical equipment and installations and has received safety training on the hazards involved. This definition also has a Fine Print Note that refers to NFPA 70E for the electrical safety training requirements.

In addition to the requirements stated in the NEC definition, NFPA 70E-2004, Section 110.6, Training Requirements, states that employees are required to be trained to understand the specific hazards associated with electrical energy, the safety-related work practices, and procedural requirements. These training requirements are necessary to help protect

employees from the electrical hazards associated with their respective job or task assignments as well as to identify and understand the relationship between electrical hazards and possible injury. Training in emergency procedures is also required when employees are working on or near exposed energized electrical conductors or circuit parts.

In addition to these requirements the NFPA 70E goes on to state that qualified persons must be familiar with:

- *Special precautionary techniques;*
- *Personal protective equipment, including arc-flash;*
- *Insulating and shielding materials; and*
- *Insulated tools and test equipment.*

OSHA 1910.399, Definitions, states the following concerning qualified persons:

Whether an employee is considered to be a qualified person will depend upon various circumstances in the workplace. It is possible and, in fact, likely for an individual to be considered qualified with regard to certain equipment in the workplace, but unqualified as to other equipment.

An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person is considered to be a qualified person for the performance of those duties.

OSHA 1910.332, Training, states the following about the training required for qualified employees:

The training requirements contained in this section [1910.332] apply to employees who face a risk of electric shock (Table S-4).

(Note: Employees in occupations listed in Table S-4 face such a risk and are required to be trained. Other employees

who also may reasonably be expected to face comparable risk of injury due to electric shock or other electrical hazards must also be trained.)

OSHA goes on to state that employees shall be trained in and familiar with the safety-related work practices...that pertain to their respective job assignments.

At a minimum, OSHA requires qualified persons to be trained in and familiar with the skills and techniques necessary to distinguish exposed live parts from other parts of electric equipment, the skills and techniques necessary to determine the nominal voltage of exposed live parts, and the clearance distances specified in 1910.333(c) and the corresponding voltages to which the qualified person will be exposed.

Note 1: For the purposes of 1910.331 through 1910.335, a person must have the training required by paragraph (b)(3) of this section in order to be considered a qualified person.

Note 2: Qualified persons whose work on energized equipment involves either direct contact or contact by means of tools or materials must also have the training needed to meet 1910.333(C)(2).

In addition to 1910.332, OSHA 1910.269 also states that a person must have this training in order to be considered a qualified person.

Also, that the employer shall determine, through regular supervision and through inspections conducted on at least an annual basis, that each employee is complying with the safety-related work practices required by this section.

OSHA 1910.269 also requires an employee to receive additional training (or retraining) under any of the following conditions:

- *If the supervision and annual inspections...indicate that the employee is not complying with the safety-related work practices required by this section, or*
- *If new technology or changes in procedures necessitate the use of safety-related work practices that are different from those which the employee would normally use, or*
- *If he or she must employ safety-related work practices that are not normally used during his or her regular job duties.*

(NOTE: OSHA would consider tasks that are performed less often than once per year to necessitate retraining before the performance of the work practices involved.)

OSHA also states that the training shall establish employee proficiency in the work practices required by this section and shall introduce the procedures necessary for compliance with this section. The employer shall certify that each employee has received the training required by paragraph (a)(2) of this section. This certification shall be made when the employee demonstrates proficiency in the work practices involved and shall be maintained for the duration of the employee's employment.

According to OSHA, Qualified Persons are intended to be only those who are well acquainted with and thoroughly conversant in the electric equipment and electrical hazards involved with the work being performed.

As can be seen by the above quotes from NFPA 70E and OSHA, an employee, in order to be considered a qualified person, must receive extensive training. In order to determine the required training a Job/Task and Hazard Analysis must be performed.

Electrical Safety Program

OSHA 1910.333(a) states that; Safety-related work practices shall be employed to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts, when work is performed near or on equipment or circuits which are or may be energized. The specific safety-related work practices shall be consistent with the nature and extent of the associated electrical hazards.

Paragraph (2) goes on to say that If the exposed live parts are not deenergized, other safety-related work practices shall be used to protect employees who may be exposed to the electrical hazards involved.

Such work practices shall protect employees against contact with energized circuit parts directly with any part of their body or indirectly through some other conductive object. The work practices that are used shall be suitable for the conditions under which the work is to be performed and for the voltage level of the exposed electric conductors or circuit parts.

Paragraph (b)(1) also states that Conductors and parts of electric equipment that have been deenergized but have not been locked out or tagged...shall be treated as energized parts, and paragraph (c) of this section applies to work on or

near them.

Paragraph (c)(1) for energized work applies to work performed on exposed live parts (involving either direct contact or by means of tools or materials) or near enough to them for employees to be exposed to any hazard they present.

Paragraph (c)(2) states that **Only qualified persons may work on electric circuit parts or equipment that have not been deenergized... Such persons shall be capable of working safely on energized circuits and shall be familiar with the proper use of special precautionary techniques, personal protective equipment, insulating and shielding materials, and insulated tools.**

Paragraph (3) states that If work is to be performed near overhead lines, the lines shall be deenergized and grounded, or other protective measures shall be provided before work is started.

The OSHA Instruction STD 1-16.7, Directorate of Compliance Programs, Electrical Safety-Related Work Practices — Inspection Procedures and Interpretation Guidelines, states: Under 1910.333(a)(2) if the employer does not deenergize, then suitable safe work practices for the conditions under which the work is to be performed shall be included in the written procedures and strictly enforced.

NFPA 70E-2004, Section 110.7 requires the employer to implement an Electrical Safety Program appropriate for the voltage, energy, and circuit conditions. This program is required to contain the following elements:

- *Awareness and Self-Discipline*
- *Electrical Safety Program Principles*
- *Electrical Safety Program Controls*
- *Electrical Safety Program Procedures*
- *Hazard/Risk Evaluation Procedure*

These guidelines, as well as the NFPA Electrical Safety Program Book, can be quite helpful in establishing an effective electrical safety program. □

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